

Machine translation of JP 2003-129043

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Notes:

1. Untranslatable words are replaced with asterisks (* **).
2. Texts in the figures are not translated and shown as it is.

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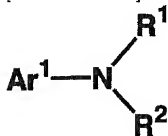
CLAIM + DETAILED DESCRIPTION

[Claim(s)]

[Claim 1] A charge of organic electroluminescence element material being a compound denoted by the following general formula [1].

A general formula [1]

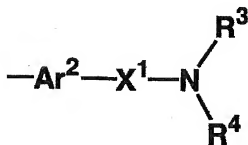
[Chemical formula 1]



Ar¹ among [type, [a PERIRENIRU machine which is not replaced / substitution or / , R¹, and R²] A univalent aromatic hydrocarbon machine which is not replaced [a univalent aliphatic hydrocarbon machine which is not replaced / substitution or / , substitution or], It is a univalent organic residue chosen from a univalent aromatic heterocycle machine which is not replaced [a univalent fatty series heterocyclic machine which is not replaced / substitution or / and substitution, or], and at least one of R¹ and the R² is a univalent organic residue denoted by the following general formula [2]. It may combine with each other and Ar¹, R¹ and Ar¹, R² and R¹, and R² may form a ring.]

General formula [2]

[Chemical formula 2]



Ar² among [type, [the divalent aromatic heterocycle machine which is not replaced / the divalent aromatic hydrocarbon machine which is not replaced / substitution or /, substitution, or /, R³, and R⁴] The univalent aromatic hydrocarbon machine which is not replaced [the univalent aliphatic hydrocarbon machine which is not replaced / substitution or /, substitution or], [the univalent organic residue chosen from the univalent aromatic heterocycle machine which is not replaced / the univalent fatty series heterocyclic machine which is not replaced / substitution or / and substitution, or /, and X¹] It is =Si(R⁷) R⁸direct combination, O, S, =C(R⁵) R⁶, or (R⁵ - R⁸ are either of the univalent aromatic hydrocarbon machines which are not replaced [the univalent aliphatic hydrocarbon machine which is not replaced / a hydrogen atom, substitution, or /, substitution, or] here). It may combine with each other and Ar², R³ and Ar², X¹ and Ar², R³ and Ar², R⁴ and X¹, R³ and X¹, R⁴ and R³, and R⁴ may form the ring.]

[Claim 2]The charge of organic electroluminescence element material according to claim 1, wherein Ar¹ is 3-PERIRENIRU machine which is not replaced [substitution or].

[Claim 3]The charge of organic electroluminescence element material according to claim 2, wherein Ar¹ is unreplaced 3-PERIRENIRU machine.

[Claim 4]There is no Claim 1, wherein each of R¹ and R² is the univalent organic residues denoted by a general formula [2], and it is a charge of organic electroluminescence element material of a description 3 either.

[Claim 5]There is no Claim 1, wherein X¹ is combination directly, and it is a charge of organic electroluminescence element material of a description 4 either.

[Claim 6]inter-electrode [which consists of cathodes and anodes / a pair of] -- much more -- or -- in an organic electroluminescence element which forms a multilayer organic layer -- at least one layer -- Claims 1-5 -- an organic electroluminescence element which is a layer containing a charge of organic electroluminescence element material of a description either.

[Claim 7]An organic electroluminescence element which is a layer which a luminous layer does not have Claim 1 in an organic electroluminescence element which forms much more luminous layer in inter-electrode [which consists of cathodes and anodes / a pair of] at least, and

contains a charge of organic electroluminescence element material of a description 5 either.
 [Claim 8]The organic electroluminescence element according to claim 7 which forms much more electronic injection layer at least between a luminous layer and an anode.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the organic EL device using the charge of organic electroluminescence (EL) element material and it which are used for the source of flat light, or a display. In detail, it has a long life and is related with the organic EL device using the charge of organic EL device material and it which can obtain yellow - red high-intensity luminescence.

[0002]

[Description of the Prior Art]Promising ** of the use as an inexpensive solid luminescence type large area full color display element is carried out, and, as for EL element which uses an organic substance, many development is performed. Generally EL element comprises a pair of opposite electrodes which sandwiched the luminous layer and this layer. Luminescence is a phenomenon which releases energy as a light, when an electric field is impressed between two electrodes, an electron is poured in from the anode side, an electron hole is poured in from the cathode side, this electron re-combines with an electron hole in a luminous layer and an energy level returns from a conducting zone to a valence band.

[0003]The conventional organic EL device had high drive voltage compared with inorganic EL element, and luminescence luminosity and its luminous efficiency were also low. Characteristic degradation had not resulted in utilization remarkably, either. In recent years, the organic EL device which laminated the thin film containing an organic compound with the high fluorescence quantum efficiency which emits light by the low voltage not more than 10V is reported, and the interest is attracted (refer to Appl.Phys.Lett., the 51st volume, 913 pages, and 1987 issue). The metal chelate complex was used for the luminous layer, it used the amine compound for the hole injection layer, and this method has obtained high-intensity green luminescence.

On the direct-current voltage of 6-10V, luminosity attains several 1000 (cd/m²), the maximum luminous efficiency attains 1.5 (lm/W), and it has the performance near a practical use field.

[0004][in an organic EL device] [luminescent material / for obtaining luminescence of especially red / yellow / for organic EL devices] C.H. Chen work, Macromol.Symp., No. 125, 34-36 pages and 49-58 pages, DCM indicated to issue in 1997, Although reported as a

luminescent material for organic EL devices for 4H-pyran derivatives, such as DCJ, DCJT, and DCJTB, to obtain red luminescence from yellow, there was a problem of it being said that luminescence luminosity is low.

[0005]On the other hand, about the luminescent material for organic EL devices which has PERIREN structure, the mono-***** JIAMINOPERIREN compound etc. which are indicated to JP,H11-144869,A, JP,2001-11031,A, and JP,2001-176664,A are known, for example.

[0006]

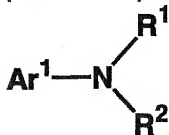
[Problem to be solved by the invention]no luminescent materials for organic EL devices for obtaining high-intensity luminescence of the yellow stated to the Prior art - red have sufficient luminescence luminosity, but there was a fault that it was short-life. On the other hand, since PERIREN is the high molecular structure of smoothness, when using as a luminescent material for organic EL devices, it tends to generate the phenomenon in which concentration quenching etc. are not preferred. Therefore, as stated to the Prior art, improvement of increasing the number of the amino groups combined with PERIREN, or introducing a bulky substituent in three dimensions is tried, but. There is concern called aggravation of the workability that the soluble fall to a solvent and the vapor deposition nature at the time of element creation worsen by increase of the molecular weight accompanying it. Therefore, the charge of organic EL device material with much more high luminescence luminosity and a long life was called for.

[0007]

[Means for solving problem]This invention persons resulted in this invention, as a result of repeating research wholeheartedly that it should solve in consideration of many above problems. That is, this invention relates to the charge of organic electroluminescence element material being a compound denoted by the following general formula [1].

[0008]General formula [1]

[Chemical formula 3]

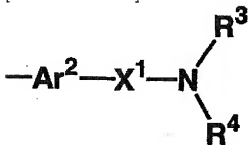


Ar¹ among [type, [the PERIRENIRU machine which is not replaced / substitution or /, R¹, and R²] The univalent aromatic hydrocarbon machine which is not replaced [the univalent aliphatic hydrocarbon machine which is not replaced / substitution or /, substitution or], It is a univalent organic residue chosen from the univalent aromatic heterocycle machine which is not

replaced [the univalent fatty series heterocyclic machine which is not replaced / substitution or / and substitution, or], and at least one of R^1 and the R^2 is a univalent organic residue denoted by the following general formula [2]. It may combine with each other and Ar^1 , R^1 and Ar^1 , R^2 and R^1 , and R^2 may form the ring.]

[0009]General formula [2]

[Chemical formula 4]



Ar^2 among [type, [the divalent aromatic heterocycle machine which is not replaced / the divalent aromatic hydrocarbon machine which is not replaced / substitution or /, substitution, or /, R^3 , and R^4] The univalent aromatic hydrocarbon machine which is not replaced [the univalent aliphatic hydrocarbon machine which is not replaced / substitution or /, substitution or], [the univalent organic residue chosen from the univalent aromatic heterocycle machine which is not replaced / the univalent fatty series heterocyclic machine which is not replaced / substitution or / and substitution, or /, and X^1] It is $=Si(R^7) R^8$ direct combination, O, S, $=C(R^5) R^6$, or ($R^5 - R^8$ are either of the univalent aromatic hydrocarbon machines which are not replaced [the univalent aliphatic hydrocarbon machine which is not replaced / a hydrogen atom, substitution, or /, substitution, or] here). It may combine with each other and Ar^2 , R^3 and Ar^2 , X^1 and Ar^2 , R^3 and Ar^2 , R^4 and X^1 , R^3 and X^1 , R^4 and R^3 , and R^4 may form the ring.]

[0010]This invention relates to the above-mentioned charge of organic electroluminescence element material, wherein Ar^1 is 3-PERIRENIRU machine which is not replaced [substitution or].

[0011]This invention relates to the above-mentioned charge of organic electroluminescence element material, wherein Ar^1 is unreplaced 3-PERIRENIRU machine.

[0012]This invention relates to the above-mentioned charge of organic electroluminescence element material, wherein each of R^1 and R^2 is the univalent organic residues denoted by a general formula [2].

[0013]This invention relates to the above-mentioned charge of organic electroluminescence element material, wherein X^1 is combination directly.

[0014]inter-electrode [which this invention becomes from a cathode and an anode / a pair of] - much more -- or in the organic electroluminescence element which forms a multilayer organic layer, at least one layer is related with the organic electroluminescence element which is a layer containing the above-mentioned charge of organic electroluminescence element material.

[0015]In the organic electroluminescence element which forms much more luminous layer in inter-electrode [which consists of cathodes and anodes / a pair of] at least, this invention relates to the organic electroluminescence element whose luminous layer is a layer containing the above-mentioned charge of organic electroluminescence element material.

[0016]This invention relates to the above-mentioned organic electroluminescence element which forms much more electronic injection layer at least between a luminous layer and an anode further.

[0017]

[Mode for carrying out the invention]Hereafter, this invention is explained extensively. The compound first denoted by the general formula [1] which is a charge of organic EL device material of this invention is explained.

[0018]First, Ar¹ in a general formula [1] expresses the PERIRENIRU machine which is not replaced [substitution or], and 1-PERIRENIRU machine, 2-PERIRENIRU machine, and 3-PERIRENIRU machine are raised as an unreplaced PERIRENIRU machine. These PERIRENIRU machine may be replaced by the substituent of further others. As such a substituent, a univalent aliphatic hydrocarbon machine, a univalent aromatic hydrocarbon machine, A univalent fatty series heterocyclic machine, a univalent aromatic heterocycle machine, a halogen atom, a cyano group, An alkoxyl group, an aryloxy group, an alkylthio group, an arylthio group, a substitution amino group, an acyl group, an alkoxy carbonyl group, an aryloxy carbonyl group, an ARUKIRU sulfonyl group, an ARIRU sulfonyl group, etc. are raised.

[0019]Here, as a univalent aliphatic hydrocarbon machine, the univalent aliphatic hydrocarbon machine of the carbon numbers 1-18 is pointed out, and an alkyl group, an alkenyl group, an alkynyl group, and a cycloalkyl machine are raised as such a thing.

[0020]As an alkyl group, therefore, a methyl group, an ethyl group, a propyl group, The alkyl group of the carbon numbers 1-18, such as an isopropyl group, a butyl group, an isobutyl machine, a sec-butyl group, a tert-butyl group, a pentyl group, an iso pentyl group, a hexyl group, a heptyl group, an octyl group, a decyl group, a dodecyl group, a pentadecyl group, and an octadecyl group, is raised.

[0021]As an alkenyl group, the alkenyl group of the carbon numbers 2-18, such as a vinyl group, 1-propenyl machine, 2-propenyl machine, an isopropenyl machine, 1-butenyl group, 2-butenyl group, 3-butenyl group, 1-octenyl group, 1-decenyl machine, and 1-octadecenyl

machine, is raised.

[0022]As an alkynyl group, the alkynyl group of the carbon numbers 2-18, such as an ethynyl group, 1-propynyl machine, 2-propynyl group, 1-butylnyl machine, 2-butylnyl machine, 3-butylnyl machine, 1-OKUCHINIRU machine, 1-decynyl machine, and 1-octa decynyl machine, is raised.

[0023]As a cycloalkyl machine, a cyclo propyl group, a cyclo butyl group, The cycloalkyl machine of the carbon numbers 3-18, such as a cyclopentyl group, a cyclohexyl group, a cycloheptyl machine, a cyclo octyl group, a cyclo octadecyl group, a 2-bornyl machine, 2-isobornyl machine, and 1-adamanthyl machine, is raised.

[0024]As a univalent aromatic hydrocarbon machine, the univalent monocycle of the carbon numbers 6-30, a condensed ring, and a ring set aromatic hydrocarbon machine are raised. Here, as a univalent monocycle aromatic hydrocarbon machine of the carbon numbers 6-30, the univalent monocycle aromatic hydrocarbon machine of the carbon numbers 6-30 of a phenyl group, o-trill machine, m-trill machine, p-trill machine, 2, 4-KISHIRIRU machine, p-cumenyl machine, a MESHICHIRU machine, etc. is raised.

[0025][as a univalent condensed ring aromatic hydrocarbon machine] 1-naphthyl group, 2-naphthyl group, 1-anthryl machine, 2-anthryl machine, 5-anthryl machine, 1-phenan thrill machine, 9-phenan thrill machine, 1-acenaphtyl machine, 2-azulenyl machine, 1-pyrenyl machine, 2-bird FENIRERU machine, The univalent condensed ring hydrocarbon group of the carbon numbers 10-30 of 1-pyrenyl machine, 2-pyrenyl machine, 1-PERIRENIRU machine, 2-PERIRENIRU machine, 3-PERIRENIRU machine, 2-TOREFENIRENIRU machine, 2-indenyl group, 1-ASENAFUCHIRENIRU machine, 2-NAFTA SENIRU machine, 2-pen TASENIRU machine, etc. is raised.

[0026]As a univalent ring set aromatic hydrocarbon machine, the univalent ring set hydrocarbon group of the carbon numbers 12-30, such as o-biphenyl machine, m-biphenyl machine, p-biphenyl machine, a TERUFENIRIRU machine, and a 7-(2-Naff Chill)-2-naphthyl group, is raised.

[0027]As a univalent fatty series heterocyclic machine, the univalent fatty series heterocyclic machine of the carbon numbers 3-18, such as a 3-iso chromanyl machine, 7-chromanyl machine, and 3-bear RINIRU, is raised.

[0028]As a univalent aromatic heterocycle machine, the univalent aromatic heterocycle machine of the carbon numbers 3-30, such as 2-frill machine, 3-frill machine, 2-thienyl group, 3-thienyl group, a 2-benzofrill machine, and a 2-benzothieryl group, is raised.

[0029]As a halogen atom, a fluorine atom, a chlorine atom, and a bromine atom are raised.

[0030]As an alkoxyl group, a methoxy group, an ethoxy basis, a propoxy group, The alkoxyl group of the carbon numbers 1-18 of a butoxy machine, a tert-butoxy machine, an octyloxy machine, a tert-octyloxy machine, a 2-bornyl OKISHI machine, 2-isobornyl OKISHI machine, 1-adamantyloxy machine, etc. is raised.

[0031]As an aryloxy group, the aryloxy group of the carbon numbers 6-30, such as a phenoxy group, a 4-tert-butylphenoxy machine, a 1-naphthoxy machine, a 2-naphthoxy machine, and 9-anthryl OKISHI machine, is raised.

[0032]As an alkylthio group, the alkylthio group of the carbon numbers 1-18, such as a methylthio group, an ethyl thio group, a tert-butyl thio group, a hexyl thio group, and an octylthio machine, is raised.

[0033]As an arylthio group, the arylthio group of the carbon numbers 6-30, such as a phenylthio group, 2-methyl phenylthio group, and a 4-tert-butyl phenylthio group, is raised.

[0034]As a substitution amino group, N-methylamino machine, N-ethylamino machine, N and N-diethylamino machine, N, and N-diisopropylamino machine, N, and N-dibutylamino machine, N-benzylamino machine, N, and N-dibenzylamino machine, N-phenylamino machine, N-phenyl N-methylamino machine, N, and N-diphenylamino machine, An N and N-bis(m-trill)amino group, N, and N-bis(p-trill)amino group, The substitution amino group of the carbon numbers 2-16 of an N and N-bis(p-biphenyl)amino group, a bis[4-(4-methyl) biphenyl] amino group, a N-alpha-Naff ****- N-phenylamino machine, a N-beta-Naff ****- N-phenylamino machine, etc. is raised.

[0035]As an acyl group, the acyl group of the carbon numbers 2-18 of an acetyl group, a pro PIONIRU machine, a pivaloyl machine, a cyclohexyl carbonyl group, a benzoyl group, a TORUOIRU machine, an anisoyl machine, a thinner MOIRU machine, etc. is raised.

[0036]As an alkoxycarbonyl group, the alkoxycarbonyl group of the carbon numbers 2-18, such as a methoxy carbonyl group and ethoxycarbonyl machine and a benzyloxycarbonyl group, is raised.

[0037]As an aryloxy carbonyl group, the aryloxy carbonyl group of the carbon numbers 2-18, such as a FENOKISHI carbonyl group and a naphthoxy carbonyl group, is raised.

[0038]As an ARUKIRU sulfonyl group, the ARUKIRU sulfonyl group of the carbon numbers 2-18, such as a MESHIRU machine, an ethyl sulfonyl group, and a propyl sulfonyl group, is raised.

[0039]As an ARIRU sulfonyl group, the ARIRU sulfonyl group of the carbon numbers 2-18, such as a benzenesulfonyl group and p-toluene sulfonyl group, is raised.

[0040]The substituent described above may be replaced by the substituent of further others.

As Ar¹ in the general formula [1] described above, 3-PERIRENIRU machine which is not replaced [substitution or] is preferred, and especially unreplaced 3-PERIRENIRU machine is preferred. When it is the structure which an amino group combines with the 3rd place of PERIREN as this Reason, it is because it thinks for the luminescence luminosity at the time of fluorescence becoming strong since the angle of a PERIREN ring and an amino group to make is comparatively maintained at the same plane, and using as an organic electroluminescence element to improve.

[0041] [in the substituent in a substitution 3-PERIRENIRU machine] [as a desirable substituent] They are raised by an alkyl group, a univalent aromatic hydrocarbon machine, a univalent aromatic heterocycle machine, an aryloxy group, and the arylthio group, and especially, [as a desirable substituent] An alkyl group, a univalent monocycle aromatic hydrocarbon machine, a univalent condensed ring aromatic hydrocarbon machine, a univalent ring set aromatic hydrocarbon machine, and a univalent aromatic heterocycle machine are raised.

[0042] As a carbon number of a substituent, 1-18 are preferred among the desirable substituents described above, and 1-12 are still more preferred. It is because concern that vapor deposition nature since the solubility over a solvent will become scarce as this Reason if the carbon number of these substituents increases, when the workability at the time of element creation worsens and refining not only tends to become difficult, but it tends to create an element by vapor deposition worsens can be considered.

[0043] Next, R^1 and R^2 in a general formula [1] are explained. R^1 and R^2 The univalent aliphatic hydrocarbon machine which is not replaced [substitution or], It is a univalent organic residue chosen from the univalent aromatic heterocycle machine which is not replaced [the univalent fatty series heterocyclic machine which is not replaced / the univalent aromatic hydrocarbon machine which is not replaced / substitution or /, substitution, or /, substitution, or], and at least one of R^1 and the R^2 is a univalent organic residue denoted by a general formula [2]. The univalent aromatic hydrocarbon machine which is not replaced [the univalent aliphatic hydrocarbon machine which is not replaced / substitution here or /, substitution or], [machine / which is not replaced / the univalent fatty series heterocyclic machine which is not replaced / substitution or /, substitution, or / univalent / aromatic heterocycle] It is synonymous with the univalent aromatic heterocycle machine which is not replaced [the univalent fatty series heterocyclic machine which is not replaced / the univalent aromatic hydrocarbon machine which is not replaced / the univalent aliphatic hydrocarbon machine which was explained by the substituent of Ar^1 , and which is not replaced / substitution or /, substitution, or /, substitution, or /, substitution, or].

[0044] Here, a general formula [2] is explained. First, Ar^2 in a general formula [2] expresses the divalent aromatic heterocycle machine which is not replaced [the divalent aromatic hydrocarbon machine which is not replaced / substitution or /, substitution, or]. A substituent here is synonymous with the substituent explained by Ar^1 .

[0045] With a divalent aromatic hydrocarbon machine here, a divalent monocycle or condensed ring, Mean a ring set aromatic hydrocarbon machine and For example, a phenylene group, a naphthylene machine, an anthrylene machine, a biphenylene machine, p-Tell *****- 4, and 4" - diyl machine. m-Tell *****- 3 and 3 - 'a' - diyl machine and m-Tell *****- 4 and 4'-diyl

machine, [1 and 2'-binaphthalene]-4, 5' – the divalent aromatic hydrocarbon machine of the carbon numbers 6-30, such as - diyl, is raised.

[0046]A divalent aromatic heterocycle machine means a divalent monocycle or a condensed ring, and a ring set aromatic heterocycle machine, for example, the divalent aromatic heterocycle machine of the carbon numbers 4-30 of 2, 5-FURIREN machine, 2, and 5-thienylene machine etc. is raised.

[0047]As a desirable thing, the divalent aromatic hydrocarbon machine of the carbon numbers 6-12 of a phenylene group, a naphthylene machine, a biphenylene machine, etc. is raised among the divalent aromatic hydrocarbon machine in Ar^2 described above, or an aromatic heterocycle machine.

[0048][R^3 in a general formula [2] and R^4] The univalent organic residue chosen from the univalent aromatic heterocycle machine which is not replaced [the univalent fatty series heterocyclic machine which is not replaced / the univalent aromatic hydrocarbon machine which is not replaced / the univalent aliphatic hydrocarbon machine which is not replaced / substitution or /, substitution, or /, substitution, or /, substitution, or /, substitution, or] is expressed. A substituent here is synonymous with the substituent explained by Ar^1 . The univalent aromatic hydrocarbon machine which is not replaced [the univalent aliphatic hydrocarbon machine which is not replaced / substitution here or /, substitution or], [machine / which is not replaced / the univalent fatty series heterocyclic machine which is not replaced / substitution or /, substitution, or / univalent / aromatic heterocycle] Respectively, it is synonymous with the univalent aromatic heterocycle machine which is not replaced [the univalent fatty series heterocyclic machine which is not replaced / the univalent aromatic hydrocarbon machine which is not replaced / the univalent aliphatic hydrocarbon machine which was explained by the substituent of Ar^1 , and which is not replaced / substitution or /, substitution, or /, substitution, or /, substitution, or].

[0049] X^1 in a general formula [2] is $=Si(R^7) R^{8direct combination, O, S, =C(R^5) R^6, or (here). [R^5 - R^8]$ It is either of the univalent aromatic hydrocarbon machines which are not replaced [the univalent aliphatic hydrocarbon machine which is not replaced / a hydrogen atom, substitution, or /, substitution, or]. Here, the univalent aromatic hydrocarbon machine which is not replaced [the univalent aliphatic hydrocarbon machine of of substitution or un-replacing in $R^5 - R^8$, substitution, or] is synonymous with the univalent aromatic hydrocarbon machine which was explained by Ar^1 and which is not replaced [the univalent aliphatic hydrocarbon machine which is not replaced / substitution or /, substitution, or].

[0050]Although at least one should just be a univalent organic residue denoted by a general formula [2] as R^1 and R^2 in a general formula [1], it is preferred that all are the univalent

organic residues denoted by a general formula [2]. Although the angle of a PERIREN ring and an amino group to make is comparatively maintained at the same plane as this Reason, since a molecule becomes three-dimensional in the case of the univalent organic residue to which each of R^1 and R^2 is expressed with a general formula [2]. It is because it thinks for the luminescence luminosity at the time of using as an organic electroluminescence element to improve since the phenomenon in which concentration quenching etc. are not preferred is suppressed. Since the conjugated system in a molecule becomes large when X^1 in a general formula [2] is combination directly, it is especially thought that luminescence luminosity improves and it is desirable.

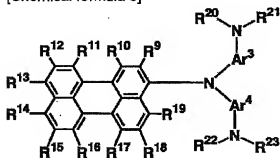
[0051]As mentioned above, although the compound denoted by the general formula [1] of this invention was explained, as a molecular weight of a compound denoted by the general formula [1] of this invention, 2000 or less are preferred, 1500 or less are still more preferred, and 1000 especially or less are preferred. It is because concern that vapor deposition nature since the solubility over a solvent will become scarce as this Reason if a molecular weight is large, when the workability at the time of element creation worsens and refining not only tends to become difficult, but it tends to create an element by vapor deposition worsens can be considered.

[0052]Although high-intensity luminescence of yellow - orange is shown, the element created to the luminous layer using the charge of organic EL device material of this invention independently is using it with a suitable doping material so that it may mention later, and it usually becomes possible even for red to make a luminescence color long-wavelength-size of it, maintaining high-intensity.

[0053]The general formula of a desirable compound group is especially shown as a general formula [3] - a general formula [5] as a charge of organic EL device material of this invention below.

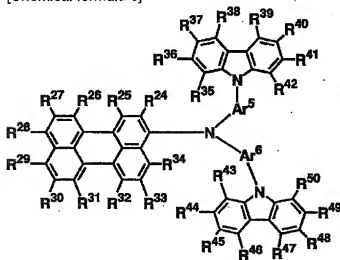
[0054]General formula [3]

[Chemical formula 5]



$R^9 - R^{19}$ among [type The univalent aliphatic hydrocarbon machine which is not replaced [a hydrogen atom, substitution, or], [or the univalent aromatic hydrocarbon machine which is not replaced / substitution or], Ar^3 and Ar^4] [the divalent aromatic heterocycle machine which is

[Chemical formula 6]



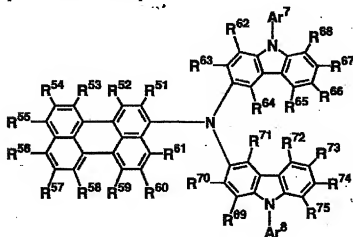
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substitution, or /, substitution, or],].

[0057][among the above-mentioned general formula [4]] [$R^{24} - R^{34}$] A hydrogen atom, a univalent unreplaced aliphatic hydrocarbon machine, or a univalent unreplaced aromatic hydrocarbon machine, [Ar^5 and Ar^6] As for $R^{35} - R^{50}$, a divalent unreplaced aromatic hydrocarbon machine or a divalent unreplaced aromatic heterocycle machine is raised as what has a desirable hydrogen atom, univalent unreplaced aliphatic hydrocarbon machine, or univalent unreplaced aromatic hydrocarbon machine.

[0058]General formula [5]

[Chemical formula 7]



$R^{51} - R^{61}$ among [type The univalent aliphatic hydrocarbon machine which is not replaced [a hydrogen atom, substitution, or], [or the univalent aromatic hydrocarbon machine which is not replaced / substitution or /, Ar^7 and Ar^8] The univalent aromatic hydrocarbon machine which is not replaced [the univalent aliphatic hydrocarbon machine which is not replaced / substitution or /, substitution or], [the univalent aromatic heterocycle machine which is not replaced / the univalent fatty series heterocyclic machine which is not replaced / substitution or /, substitution or /, $R^{62} - R^{75}$] It is a univalent aromatic heterocycle machine which is not replaced [the univalent fatty series heterocyclic machine which is not replaced / the univalent aromatic hydrocarbon machine which is not replaced / the univalent aliphatic hydrocarbon machine which is not replaced / a hydrogen atom, substitution, or /, substitution, or /, substitution, or /, substitution, or],].

[0059][among the above-mentioned general formula [5]] [$R^{51} - R^{61}$] [a hydrogen atom, a univalent unreplaced aliphatic hydrocarbon machine or a univalent unreplaced aromatic hydrocarbon machine, Ar^7 , and Ar^8] As for $R^{62} - R^{75}$, a univalent unreplaced aromatic hydrocarbon machine is raised as what has a desirable hydrogen atom, univalent unreplaced

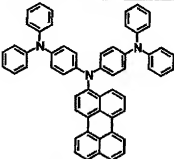
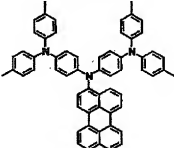
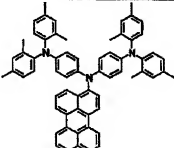
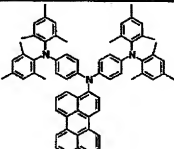
aliphatic hydrocarbon machine, or univalent unreplaced aromatic hydrocarbon machine.

[0060]The definition of the functional group of general formula [3] - [5] is the same as that of a general formula [1] and the functional group of [2].

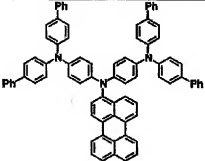
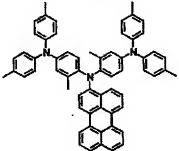
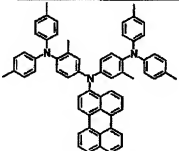
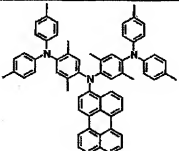
[0061]Although the example of representation of the compound which can be used as a charge of organic EL device material of this invention is hereafter shown in Table 1, this invention is not limited to these at all (however, t-Bu expresses a tertiary butyl machine among Table 1, Ph expresses a phenyl group, and Tol expresses p-trill machine).

[0062]

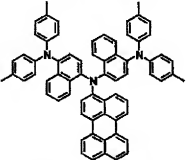
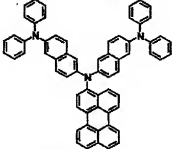
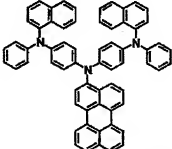
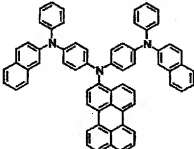
[Table 1]

化合物	化学構造
(1)	
(2)	
(3)	
(4)	

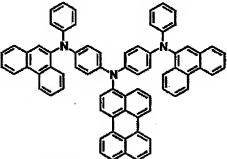
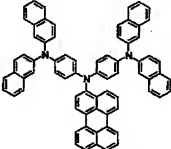
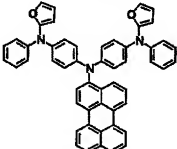
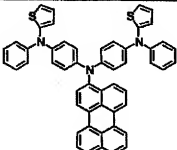
[0063]

化合物	化学、構造
(5)	
(6)	
(7)	
(8)	

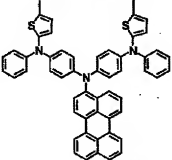
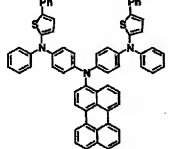
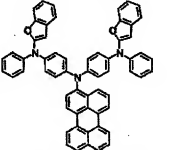
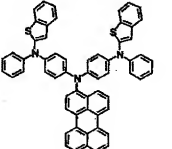
[0064]

化合物	化学構造
(9)	
(10)	
(11)	
(12)	

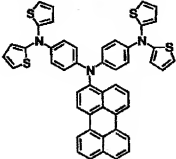
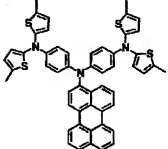
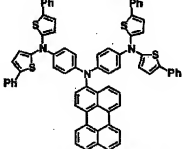
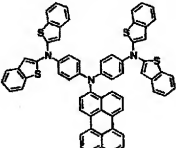
[0065]

化合物	化学構造
(13)	
(14)	
(15)	
(16)	

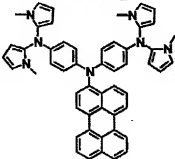
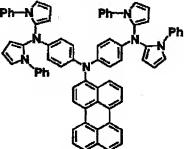
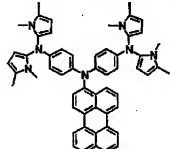
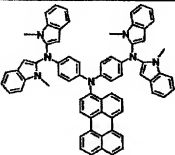
[0066]

化合物	化学構造
(17)	
(18)	
(19)	
(20)	

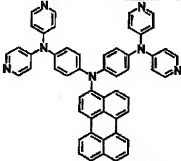
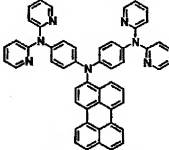
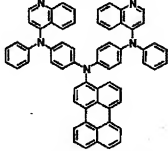
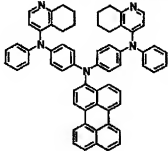
[0067]

化合物	化学構造
(21)	
(22)	
(23)	
(24)	

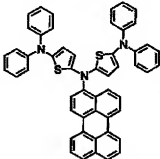
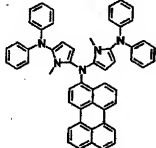
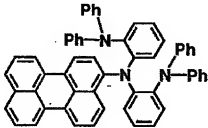
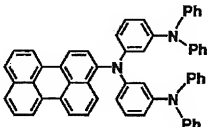
[0068]

化合物	化学構造
(25)	
(26)	
(27)	
(28)	

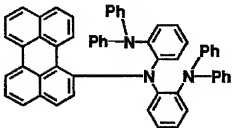
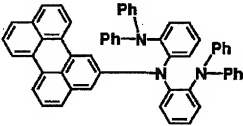
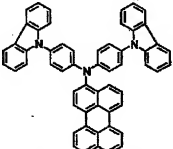
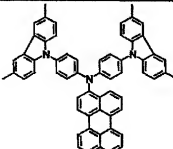
[0069]

化合物	化学、構造
(29)	
(30)	
(31)	
(32)	

[0070]

化合物	化 学 構 造
(33)	
(34)	
(35)	
(36)	

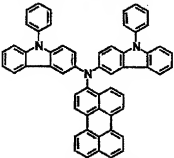
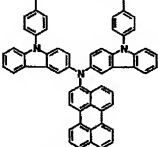
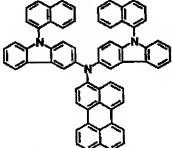
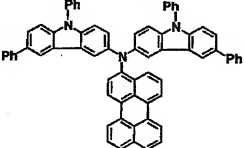
[0071]

化合物	化学構造
(37)	
(38)	
(39)	
(40)	

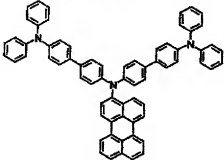
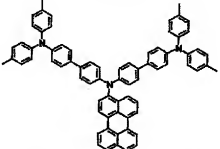
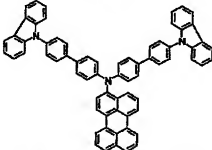
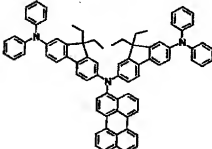
[0072]

化合物	化学構造
(41)	
(42)	
(43)	
(44)	

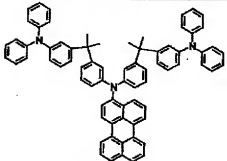
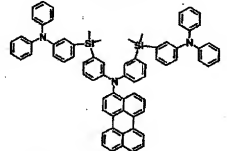
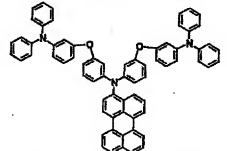
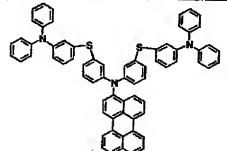
[0073]

化合物	化 学、调 造
(45)	
(46)	
(47)	
(48)	

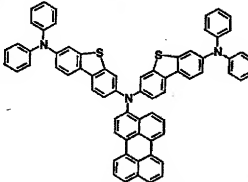
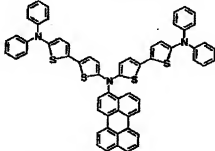
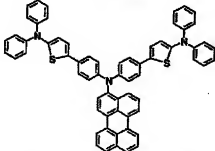
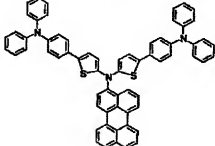
[0074]

化合物	化学構造
(49)	
(50)	
(51)	
(52)	

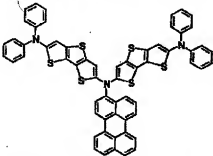
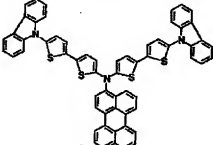
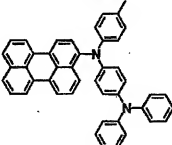
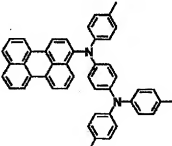
[0075]

化合物	化学構造
(53)	
(54)	
(55)	
(56)	

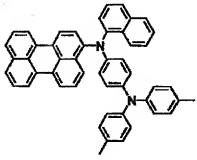
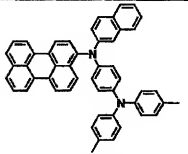
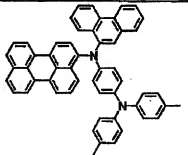
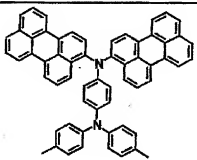
[0076]

化合物	化学構造
(57)	
(58)	
(59)	
(60)	

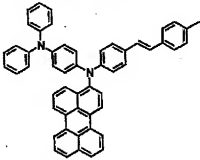
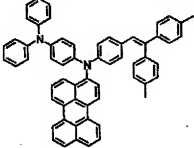
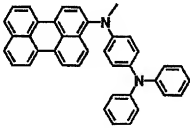
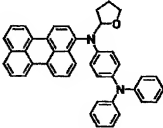
[0077]

化合物	化 学 構 造
(61)	
(62)	
(63)	
(64)	

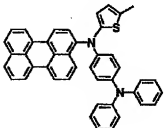
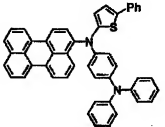
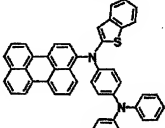
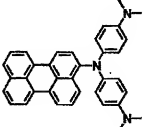
[0078]

化合物	化学構造
(65)	
(66)	
(67)	
(68)	

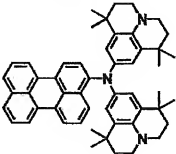
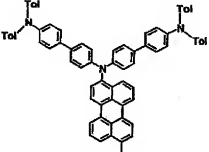
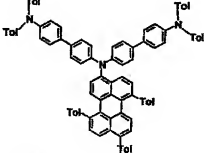
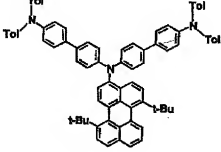
[0079]

化合物	化学構造
(69)	
(70)	
(71)	
(72)	

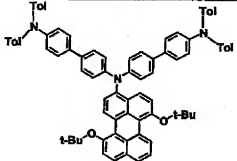
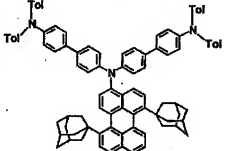
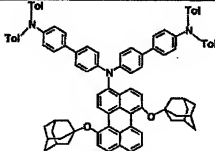
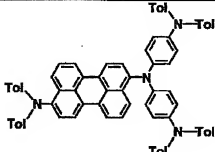
[0080]

化合物	化 学 構 造
(73)	
(74)	
(75)	
(76)	

[0081]

化合物	化 学 構 造
(7 7)	
(7 8)	
(7 9)	
(8 0)	

[0082]

化合物	化学構造
(81)	
(82)	
(83)	
(84)	

[0083]

化合物	化学構造
(85)	
(86)	
(87)	
(88)	

[0084]by the way, an organic EL device — between a cathode and an anode — much more — or although it is an element in which the multilayer organic layer was formed, a model organic EL device has further a luminous layer which consists of luminescent materials between a cathode and an anode here. On the other hand, a multilayer type organic EL device is an organic EL device laminated by multilayered constitution, such as (a cathode / hole injection layer / luminous layer / anode), and (a cathode / luminous layer / electronic injection layer /

anode) (a cathode / hole injection layer / luminous layer / electronic injection layer / anode). The charge of organic EL device material of this invention can be conveniently used as a luminescent material of these one-layer type thru/or a multilayer type organic EL device, although it can be used for said any layer. When creating a model organic EL device further especially using the luminescent material for these organic EL devices, the electron hole pouring material or electronic pouring material for making the electron poured in from the electron hole poured in from the cathode or the anode convey efficiently to a luminescent material can be made to contain.

[0085] Here, electron hole pouring material means the compound which showed the electron hole pouring effect of having excelled to the luminous layer or the luminescent material, and prevented movement into the electronic injection layer or electronic pouring material of an exciton generated by the luminous layer, and was excellent in thin film formation nature. As an example of such an electron hole pouring material, a phthalocyanine system compound, a naphthalocyanine system compound, a porphyrin system compound, oxadiazole, and doria — ZORU and imidazole. Imidazolone, imidazole thione, PIRAZORIN, PIRAZORON, tetrahydro imidazole, OKISAZORU, oxadiazole, hydrazone, ASHIRU hydrazone, Although poly ARIRU Alekan, SUCHIRUBEN, butadiene, benzidine type bird phenylamine, styryl amine type bird phenylamine, diamine type bird phenylamine, etc. those derivatives and polyvinyl carbazole, polysilane, a conductive polymer, etc. are raised, This invention is not limited to these.

[0086] As an effective electron hole pouring material, the third class of aromatic series amine derivative or a phthalocyanine derivative is especially raised also in the above-mentioned electron hole pouring material. As the third class of aromatic series amine derivative, bird phenylamine, trityl amine, The trill diphenylamine, N, and N'-(3-methylphenyl)-1, 1'-biphenyl 4 and 4'-Gia Min, N,N,N', N'-(4-methylphenyl)-1, 1'-phenyls 4 and 4'-Gia Min, N,N,N', N'-(4-methylphenyl)-1, 1'-biphenyl 4 and 4'-Gia Min, N, the N'-diphenyl N and N'-dinaphthyl 1, 1'-biphenyl 4 and 4'-Gia Min, N, N'-(methylphenyl)-N, N'-(4-n-buthylphenyl)-The phenanthrene 9, 10-Gia Min, Oligomer or polymer which has N and N-bis(4-G 4-tolylamino phenyl)-4-phenyl cyclohexane or these the third class of aromatic series amine frame is raised. [as a phthalocyanine (Pc) derivative] H₂Pc, CuPc, CoPc, NiPc, ZnPc, PdPc, FePc, MnPc, ClAlPc, ClGaPc, ClInPc, A phthalocyanine derivative and naphthalocyanine derivatives, such as ClSnPc, Cl₂SiPc, (HO) AlPc, (HO) GaPc, VOPc, TiOPc, MoOPc, and GaPc-O-GaPc, are raised. The electron hole pouring material described above can add and carry out the feeling of increase of the electronic acceptance material further.

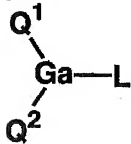
[0087] On the other hand, electronic pouring material means the compound which showed the electronic pouring effect of having excelled to the luminous layer or the luminescent material, and prevented movement into the hole injection layer or electron hole pouring material of an exciton generated by the luminous layer, and was excellent in thin film formation nature. As an

example of such an electronic pouring material, a quinoline metal complex, oxadiazole, A benzothia ZORU metal complex, a BENZOOKI Southall metal complex, a benzimidazole metal complex, A fluorenone, anthra KINOJI methane, diphenokine, thiopyran dioxide, oxadiazole, thiadiazole, tetra-ZORU, PERIREN tetracarboxylic acid, FUREORENIRIDEN methane, anthra KINOJI methane, Antron, etc. and those derivatives are raised. Although the inorganic matter / organic composite material (for example, the Society of Polymer Science, Japan proceedings, the 50th volume, No. 4, 660 pages, 2001 issue) which doped metal, such as cesium, to BASOFENANTORORIN are also raised as an example of electronic pouring material, this invention is not limited to these.

[0088]As an effective electronic pouring material, a metal complex compound or a nitrogen-containing 5 membered-ring derivative is especially raised also in the above-mentioned electronic pouring material. Here, the compound shown by the following general formula [6] also in a metal complex compound can be used conveniently.

General formula [6]

[Chemical formula 8]



Q¹ and Q² express independently the hydroxy benzoquinoline derivative which is not replaced [the hydroxy quinoline derivative which is not replaced / substitution or /, substitution, or] among [type, respectively, L The aryl group which is not replaced [the cycloalkyl machine which is not replaced / the alkyl group which is not replaced / a halogen atom, substitution, or /, substitution, or /, substitution or], or the aromatic heterocycle machine which is not replaced [substitution or] and -OR (R – a hydrogen atom.) The aryl group which is not replaced [the cycloalkyl machine which is not replaced / the alkyl group which is not replaced / substitution or /, substitution, or /substitution or], Or the aromatic heterocycle machine which is not replaced [substitution or] is expressed. At least ** denoted by -O-Ga-Q³ (Q⁴) (Q³ and Q⁴ express the same meaning as Q¹ and Q².) expresses a child.]

[0089]A general formula [6] is explained here. Q¹ of the compound shown by a general formula [6] - Q⁴ are hydroxy benzoquinoline derivatives which are not replaced [the hydroxy quinoline derivative which is not replaced / substitution or /, substitution, or]. A substituent here is synonymous with the substituent in R¹ in a general formula [1], and R².

[0090]L expresses the aromatic heterocycle machine which is not replaced [the aryl group which is not replaced / the cycloalkyl machine which is not replaced / the alkyl group which is not replaced / a halogen atom, substitution, or /, substitution, or /, substitution, or /, substitution, or]. A substituent here is synonymous with the substituent in R^1 in a general formula [1], and R^2 . As a cycloalkyl machine which is not replaced [substitution or], a cyclopentyl group, a cyclohexyl group, a cycloheptyl machine, a cyclo octyl group, a cyclo nonyl group, a cyclo DEKANIRU machine, etc. can be raised.

[0091]Therefore, [as an example of the compound shown by a general formula [6]] A bis(2-methyl 8-hydroxyquinolate)(1-naphth RATO) gallium complex, A bis(2-methyl 8-hydroxyquinolate)(2-naphth RATO) gallium complex, A bis(2-methyl 8-hydroxyquinolate) (phenolate) gallium complex, A bis(2-methyl 8-hydroxyquinolate)(4-cyano 1-naphth RATO) gallium complex, A bis(2, 4-*****- 8-hydroxyquinolate)(1-naphth RATO) gallium complex, A bis(2, 5-*****- 8-hydroxyquinolate)(2-naphth RATO) gallium complex, A bis(2-methyl 5-phenyl 8-hydroxyquinolate)(phenolate) gallium complex, A bis(2-methyl 5-cyano 8-hydroxyquinolate)(4-cyano 1-naphth RATO) gallium complex, Although a bis(2-methyl 8-hydroxyquinolate)chloro gallium complex, a bis(2-methyl 8-hydroxyquinolate)(o-cresolate) gallium complex, etc. are raised, this invention is not limited to these. The compound shown by these general formulas [6] can be compounded by a method given in JP,H10-88121,A.

[0092]In addition, [this invention] [among usable electronic pouring materials] [as a desirable metal complex compound] 8-hydroxyquinolate lithium, bis(8-hydroxyquinolate) zinc, Bis(8-hydroxyquinolate)copper, bis(8-hydroxyquinolate)manganese, Tris(8-hydroxyquinolate)aluminium, tris (2-methyl 8-hydroxyquinolate) aluminum, Tris (8-hydroxyquinolate) gallium, bis(10-hydroxy benzo[h] quinolate)beryllium, bis(10-hydroxy benzo[h] quinolate)zinc, etc. are raised.

[0093][this invention] [among usable electronic pouring materials] [as a desirable nitrogen-containing 5 member derivative] It is raised by OKISAZORU, thia ZORU, oxadiazole, thiadiazole, or the bird azole derivative, and specifically, 2, 5-bis(1-phenyl)-1, 3, 4-OKISAZORU, JIMECHIRU POPOP. 2, 5-bis(1-phenyl)-1, 3, 4-thia ZORU, 2, 5-bis(1-phenyl)-1, 3, 4-oxadiazole, 2-(4'-tert-buthylphenyl)-5-(4"-biphenyl)1,3,4-oxadiazole, 2, 5-bis(1-Naff Chill)-bis[1, 3, 4-oxadiazole, 1, and 4-] [2- (5 - phenyl oxadiazoly)] benzene, 1, 4-screw [2-(5-phenyl oxadiazoly)]-4-tert-butyl benzene], 2-(4'-tert- buthylphenyl)-5 -(4"-biphenyl)- 1,3,4-thiadiazole, 2, 5-bis(1-Naff Chill)-1,3,4-thiadiazole, 1, and 4-bis[2- (5-phenyl thiadiazoly)] benzene, 2-(4'-tert-buthylphenyl)-5-(4"-biphenyl)-1, and 3 - and, [4-doria] 2, 5-bis(1-Naff Chill)-1, and 3 and 4 - doria - ZORU, 1, and 4-bis[2- (5-FE nil triazory)] benzene etc. are raised. The electronic pouring material described above can add and carry out the feeling of increase of the electron release nature material further.

[0094]The charge of organic EL device material of this invention can also be doped and used

into a luminous layer. In this case, as for the charge of this organic EL device material, it is preferred to contain in 0.001 to 50weight % of the range to the host material explained below, and also it is more preferred to contain in 0.01 to 10weight % of the range.

[0095][as a host material which can be used when / both / the charge of organic EL device material of this invention is used as a doping material] A quinoline metal complex, a benzoquinoline metal complex, a BENZOOKI Southall metal complex, benzof a benzothia ZORU metal complex, a benzimidazole metal complex, and] -- doria -- electron-transport-property materials, such as a ZORU metal complex, an imidazole derivative, an oxadiazole derivative, a thiadiazole derivative, and a bird azole derivative. Or a SUCHIRUBEN derivative, a butadiene derivative, a benzidine type bird phenylamine derivative, The polymer material of conductive polymers, such as hole-transport materials, such as a styryl amine type bird phenylamine derivative, a JIAMINO anthracene type bird phenylamine derivative, and the Gia Minot phenanthrene type bird phenylamine derivative, and polyvinyl carbazole, and polysilane, etc. are raised.

[0096]Into the luminous layer in this organic EL device, it can also be used besides the charge of organic EL device material of this invention, combining other luminescent materials and doping materials two or more kinds. In this case, the charge of organic EL device material of this invention may function as a host material. [as other luminescent materials or doping materials which can be used with the charge of organic EL device material of this invention] Anthracene, NAFUTAREN, phenanthrene, pyrene, TETORASEN, KORONEN, KURISEN, fluorescein, PERIREN, phtalo PERIREN, Naphthalo PERIREN, PERINON, phtalo PERINON, naphthalo PERINON, Diphenyl butadiene, tetra-phenyl butadiene, Kumarin, oxadiazole, Aldazine, screw benzoKISAZORIN, screw styryl, pyrazine, cyclo pen TAJIEN, A quinoline metal complex, an amino quinoline metal complex, imine, diphenyl ethylene, Those derivatives, such as vinyl anthracene, JIAMINO carbazole, Piran, thiopyran, poly methine, merocyanine, an imidazole chelation OKISHINOIDO compound, cinchona bark KURIDON, and rubrene, are raised.

[0097]Into the luminous layer in this organic EL device, It can also be used besides the charge of organic EL device material of this invention if needed, combining not only other luminescent materials and doping materials but the electron hole pouring material and electronic pouring material which were described previously two or more kinds. A hole injection layer, a luminous layer, and an electronic injection layer may be formed by the layer composition of two or more layers, respectively.

[0098][the conductive material used for the cathode of the organic EL device of this invention] The thing with a bigger work function than 4 eV is suitable, and, [as such a thing] Carbon, aluminum, vanadium, iron, cobalt, nickel, tungsten, Organic conductive polymers, such as metal oxide, such as tin oxide, indium oxide, etc. which are called those alloys, an ITO board,

and a NESA board, such as silver, gold, platinum, and palladium, and also poly CHIOFEN, and polypyrrole, are raised.

[0099] [the conductive material used for the anode of the organic EL device of this invention] The thing with a work function smaller than 4 eV is suitable, and those alloys, such as magnesium, calcium, tin, a lead, titanium, yttrium, lithium, lithium fluoride, RUTENIUMU, and manganese, are raised as such a thing. Here, although magnesium/silver, magnesium/indium, lithium / aluminum is raised as an example of representation as an alloy, it is not limited to these. Since the ratio of an alloy is controllable by the cooking temperature at the time of manufacture, atmosphere, and a degree of vacuum, it can prepare the alloy which consists of a suitable ratio. As long as these cathodes and an anode have necessity, they may be formed by the layer composition of two or more layers.

[0100] In order to make the organic EL device of this invention emit light efficiently, in the luminescence wavelength area of an element, the transparent enough thing of the material which constitutes an element is desirable, and it is desirable for a substrate to be also simultaneously transparent. A transparent electrode can be created by methods, such as vapor deposition and sputtering, using the above-mentioned conductive material. As for especially the electrode of a light-emitting surface, it is desirable for optical transmittance to be not less than 10%. A substrate has mechanical and thermal intensity, especially if transparent, it is not limited, but transparency polymer, such as a glass substrate, polyethylene, polyether sulphone, and polypropylene, is recommended, for example.

[0101] As a formation method of each layer of the organic EL device of this invention, one method of the wet forming-membranes methods, such as the dry type forming-membranes methods, such as vacuum deposition, sputtering, plasma, and ion plating, or spin coating, dipping, and flow coating, is applicable. Although the film thickness in particular of each layer is not limited, it is necessary to set it as suitable film thickness. If film thickness is too thick, in order to obtain fixed optical power, big impressed electromotive force will be needed and efficiency will worsen. Conversely, if film thickness is too thin, a pinhole etc. occur, and even if it impresses an electric field, sufficient luminescence luminosity will come to profitable be hard. Therefore, the usual film thickness has the more preferred range of 0.2 micrometer from 10 nm, although the range of 1 micrometer is suitable from 1 nm.

[0102] In the case of the wet forming-membranes method, each layer dissolves or distributes the material which constitutes it to suitable solvents, such as toluene, chloroform, a tetrahydro franc, and dioxane, and forms a thin film. Although it was single or mixed, any may be sufficient as the solvent used here. Also in which wet forming-membranes method, suitable polymer and additive agent may be used on a membrane formation disposition for pinhole prevention of a film etc. As such polymer, polystyrene, polycarbonate, poly arylate, Polyester, polyamide, polyurethane, polysulfone, polymethyl methacrylate, Conductive polymers, such as

optical conductive polymers, such as insulating polymer, such as polymethyl acrylate and cellulose, poly-N-vinylcarbazole, and polysilane, poly CHIOFEN, and polypyrrole, can be mentioned. An antioxidant, an ultraviolet ray absorbent, a plasticizer, etc. can be raised as an additive agent. Since the compatibility between the molecules of each compound is good when forming the material of this invention by a wet type, a good film can be obtained by making into a mixed material with a coherent low derivative the compound in which coherence becomes high and a film becomes uneven easily if independent.

[0103] Since it is improvement in stability to the temperature of the organic EL device obtained by this invention, humidity, atmosphere, etc., a protection layer may be provided on the surface of an element, or the whole element may be covered with silicone oil, polymer, etc.

[0104] As stated above, the organic EL device created using the charge of this organic EL device material can raise the characteristics, such as luminous efficiency and the maximum luminescence luminosity. Since usable luminescence luminosity is obtained practical on low drive voltage, this organic EL device can also reduce degradation which was a big problem to the former. Therefore, this organic EL device can consider the application to light sources, such as a copying machine and a printer, light sources, such as a liquid crystal display and instruments, a display board, a beacon light, etc. further as flat-panel displays and plane photogens, such as a flat TV.

[0105]

[Working example] Hereafter, although an embodiment explains this invention concretely, this invention is not limited to the following embodiment at all. First, in advance of an embodiment, the synthetic example of the charge of organic EL device material of this invention is described.

[0106] In 200 ml of synthesizing method xylene of synthetic example 1 compound (2), the 4-bromo phenyl bis(4-methylphenyl)amine 6.9g, 2.4 g of 3-amino PERIREN, 2.0 g of sodium t-butoxide, 0.10g of palladium acetate, and 0.36 g of free t-butyl phosphine were added, and heating flowing back was carried out under a nitrogen atmosphere for 2 hours, agitating. It filtered after radiational cooling, and **** was condensed, the column chromatography using silica gel refined, and 5.2 g of compounds (2) were obtained. Structure was checked by analysis by the mass spectrum, a NMR spectrum, and ultimate analysis. The ¹H-NMR spectrum (based on the absorption peak of tetramethyl SHIRAN) of the compound (2) measured in tetrahydro franc d₈ solution is shown in Fig. 1.

[0107] In 100 ml of synthesizing method toluene of synthetic example 2 compound (3), the 4-bromo phenyl bis(2, 4-dimethylphenyl)amine 10.3g, 3.4 g of 3-amino PERIREN, 3.2 g of sodium t-butoxide, 0.12g of palladium acetate, and 0.41 g of free t-butyl phosphine were added, and heating flowing back was carried out under a nitrogen atmosphere for 4 hours, agitating. It filtered after radiational cooling, and **** was condensed, column chromatography

using silica gel refined, and 9.3 g of compounds (3) were obtained. Structure was checked by analysis by mass spectrum, a NMR spectrum, and ultimate analysis. An emission spectrum of a compound (3) measured in toluene solution is shown in Fig. 2.

[0108]In 500 ml of synthesizing method xylene of synthetic example 3 compound (39), 35.0 g of 9-(4-chlorophenyl) carbazole, 16.0 g of 3-amino PERIREN, 13.8 g of sodium t-butoxide, 0.67g of palladium acetate, and 2.43 g of tree t-butyl phosphine were added, and heating flowing back was carried out under a nitrogen atmosphere for 8 hours, agitating. It filtered after radiational cooling, and **** was condensed, column chromatography using silica gel refined, and 30.1 g of compounds (39) were obtained. Structure was checked by analysis by mass spectrum, a NMR spectrum, and ultimate analysis. A ^1H -NMR spectrum (based on an absorption peak of tetramethyl SHIRAN) of a compound (39) measured in CDCl_3 solution is shown in Fig. 3.

[0109]In 500 ml of synthesizing method xylene of synthetic example 4 compound (49), 19.7 g of diphenyl 4-iodine biphenyl 4-ylamine, 5.3 g of 3-amino PERIREN, 5.4 g of sodium t-butoxide, 0.22g of palladium acetate, and 0.81 g of tree t-butyl phosphine were added, and heating flowing back was carried out under a nitrogen atmosphere for 3 hours, agitating. It filtered after radiational cooling, and **** was condensed, the column chromatography using silica gel refined, and 12.9 g of compounds (49) were obtained. Structure was checked by analysis by the mass spectrum, a NMR spectrum, and ultimate analysis. The ^1H -NMR spectrum (based on the absorption peak of tetramethyl SHIRAN) of the compound (49) measured in tetrahydro franc d_8 solution is shown in Fig. 4.

[0110]In 500 ml of synthesizing method xylene of synthetic example 5 compound (64), 8.7 g of 4-bromo toluene, 13.6 g of 3-amino PERIREN, 5.43 g of sodium t-butoxide, 0.29g of palladium acetate, and 1.0 g of tree t-butyl phosphine were added, and it heated at 80 ** under a nitrogen atmosphere for 8 hours, agitating. It filtered after radiational cooling, and **** was condensed, the column chromatography using silica gel refined, and the 3-Pelli Reni Lu 4-methylphenyl amine 11.3g was obtained. In 200 ml of xylene, then, the 4-bromo phenyl bis(4-methylphenyl) amine 2.3g, The 3-Pelli Reni Lu 4-methylphenyl amine 2.1g, 0.66 g of sodium t-butoxide, 0.03g of palladium acetate, and 0.12 g of tree t-butyl phosphine were added, and heating flowing back was carried out under a nitrogen atmosphere for 2 hours, agitating. It filtered after radiational cooling, and **** was condensed, the column chromatography using silica gel refined, and 3.1 g of compounds (64) were obtained. Structure was checked by analysis by the mass spectrum, a NMR spectrum, and ultimate analysis. The ^1H -NMR spectrum (based on the absorption peak of tetramethyl SHIRAN) of the compound (64) measured in tetrahydro franc d_8 solution is shown in Fig. 5.

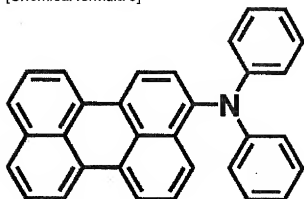
[0111]The embodiment which used the compound of this invention for below is shown. By this

example, especially, as long as there is no notice, all the mixture ratio shows a weight ratio.
The characteristic of the organic EL device of 2 mm x 2 mm of electrode surface products was measured. A publicly known material shown below in operation was used.

(Comparison compound A)

[0112]

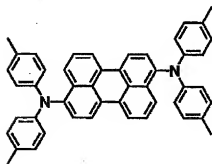
[Chemical formula 9]



[0113](Comparison compound B)

[0114]

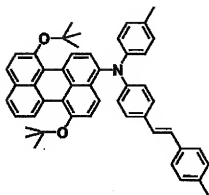
[Chemical formula 10]



[0115](Comparison compound C)

[0116]

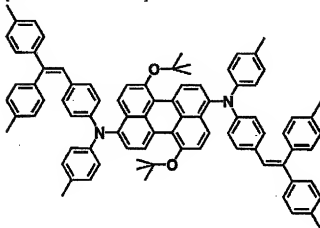
[Chemical formula 11]



[0117](Comparison compound D)

[0118]

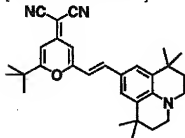
[Chemical formula 12]



[0119](DCJTB)

[0120]

[Chemical formula 13]



[0121]On the glass board with an ITO electrode washed embodiment 1, as a luminescent material, the compound (1) of Table 1, 2, 5-bis(1-Naff Chill)-1, 3, 4-oxadiazole, and polycarbonate resin (Teijin Chemicals: pan-light K-1300) were dissolved in the tetrahydro franc

by the weight ratio of 1:2:10, and the luminous layer of 100 nm of film thickness was obtained with the spin coating method. The electrode of 150 nm of film thickness was formed with the alloy which moreover mixed silver with magnesium by 10:1 (weight ratio), and the organic EL device was obtained. As for the luminescent property of this element, luminescence of the luminescence luminosity $550 \text{ (cd/m}^2\text{)}$ in the direct-current voltage 10V, the maximum luminescence luminosity $740 \text{ (cd/m}^2\text{)}$, and luminous efficiency 0.49 (lm/W) was obtained.

[0122] 1 and 2-dichloro ethane is made to dissolve N and N'-(3 **MECHIRU phenyl)-N, N' **JIFENIRU** 1, 1 *****- 4 and 4' **JIAMIN (TPD), and polyvinyl carbazole (PVK) by the weight ratio of 1:1 on the glass board with an ITO electrode washed embodiment 2, The hole injection layer of 50 nm of film thickness was obtained with the spin coating method. Subsequently, the compound (3) of Table 1 was vapor-deposited, the electronic injection luminescence layer of 60 nm of film thickness was created, the electrode of 100 nm of film thickness was formed on it with the alloy which mixed silver with magnesium by 10:1 (weight ratio), and the organic EL device was obtained. As for the luminescent property of this element, luminescence of the luminescence luminosity $1300 \text{ (cd/m}^2\text{)}$ in the direct-current voltage 10V, the maximum luminescence luminosity $1800 \text{ (cd/m}^2\text{)}$, and luminous efficiency 0.71 (lm/W) was obtained.

[0123] On the glass board with an ITO electrode washed embodiment 3, TPD and polyvinyl carbazole (PVK) were dissolved in 1 and 2-dichloro ethane by the weight ratio of 1:1, and the hole injection layer of 50 nm of film thickness was obtained with the spin coating method. Subsequently, the mixture which consists of a weight ratio of 1:50 of the compound (5) of Table 1 and a tris(8-hydroxyquinolate)aluminium complex (Alq3) is vapor-deposited, The electronic injection luminescence layer of 60 nm of film thickness was created, the electrode of 100 nm of film thickness was formed on it with the alloy which mixed silver with magnesium by 10:1 (weight ratio), and the organic EL device was obtained. As for the luminescent property of this element, luminescence of the luminescence luminosity $1900 \text{ (cd/m}^2\text{)}$ in the direct-current voltage 10V, the maximum luminescence luminosity $3300 \text{ (cd/m}^2\text{)}$, and luminous efficiency 1.2 (lm/W) was obtained.

[0124] On the glass board with an ITO electrode washed embodiment 4, the compound (11) of Table 1 was dissolved in the methylene chloride, and the electron hole injection luminescence layer of 50 nm of film thickness was obtained with the spin coating method. Subsequently, vacuum deposition of the bis(2-methyl 8-hydroxyquinolate)(1-naphthyl RATO) gallium complex was carried out, the electronic injection layer of 40 nm of film thickness was created, the electrode of 100 nm of film thickness was formed on it with the alloy which mixed silver with magnesium by 10:1 (weight ratio), and the organic EL device was obtained. The electronic injection layer was vapor-deposited under the conditions of substrate temperature room

temperature in the vacuum of 10^{-6} Torr. As for this element, luminescence of the luminescence luminosity $3100 \text{ (cd/m}^2\text{)}$ in the direct-current voltage 6V, the maximum luminescence luminosity $11300 \text{ (cd/m}^2\text{)}$, and luminous efficiency 2.4 (lm/W) was obtained.

[0125]On the glass board with an ITO electrode washed embodiment 5, vacuum deposition of the compound (20) of Table 1 was carried out, and the electron hole injection luminescence layer of 50 nm of film thickness was obtained. Subsequently, carry out vacuum deposition of the bis(2-methyl 8-hydroxyquinoline)(p-cyano phenolate) gallium complex, and the electronic injection layer of 30 nm of film thickness is created, The electrode of 100 nm of film thickness was formed with the alloy which moreover mixed silver with magnesium by 10:1 (weight ratio), and the organic EL device was obtained. Each layer was vapor-deposited under the conditions of substrate temperature room temperature in the vacuum of 10^{-6} Torr. As for this element, luminescence of the luminescence luminosity $3600 \text{ (cd/m}^2\text{)}$ in the direct-current voltage 6V, the maximum luminescence luminosity $12400 \text{ (cd/m}^2\text{)}$, and luminous efficiency 2.5 (lm/W) was obtained.

[0126]On the glass board with an ITO electrode washed embodiment 6, vacuum deposition of the TPD was carried out and the hole injection layer of 20 nm of film thickness was obtained. Subsequently, the compound (46) of Table 1 was vapor-deposited, the luminous layer of 40 nm of film thickness was created, subsequently Alq3 was vapor-deposited, and the electronic injection layer of 30 nm of film thickness was obtained. The electrode of 200 nm of film thickness was formed with the alloy which moreover mixed silver with magnesium by 10:1 (weight ratio), and the organic EL device was obtained. Each layer was vapor-deposited under the conditions of substrate temperature room temperature in the vacuum of 10^{-6} Torr. As for this element, luminescence of the luminescence luminosity $6400 \text{ (cd/m}^2\text{)}$ was obtained on the direct-current voltage 6V. When the constant current drive was carried out by the luminescence luminosity $500 \text{ (cd/m}^2\text{)}$, the reduction-by-half life was 1000 hours.

[0127]The organic EL device was produced by the same method as Embodiment 6 except forming and using said comparison compound A instead of comparative example 1 compound (46). The luminescence luminosity in the direct-current voltage 6V of this element was $1600 \text{ (cd/m}^2\text{)}$. When the constant current drive was carried out by the luminescence luminosity $500 \text{ (cd/m}^2\text{)}$, the reduction-by-half life was 260 hours.

[0128]On the glass board with an ITO electrode washed embodiment 7, vacuum deposition of the TPD was carried out and the hole injection layer of 40 nm of film thickness was obtained. Subsequently, vapor codeposition of Alq3 was carried out to the compound (47) of Table 1 by the composition ratio of 1:50 (weight ratio), and the luminous layer of 30 nm of film thickness was obtained. Alq3 was vapor-deposited and the electronic injection layer of 30 nm of film

thickness was obtained. The electrode of 200 nm of film thickness was formed with the alloy which moreover mixed silver with magnesium by 10:1 (weight ratio), and the organic EL device was obtained. Each layer was vapor-deposited under the conditions of substrate temperature room temperature in the vacuum of 10^{-6} Torr. As for this element, luminescence of 57000 (cd/m^2) was obtained [the luminescence luminosity in the direct-current voltage 6V] for 7200 (cd/m^2) and the luminescence luminosity of 20V. When the constant current drive was carried out by the luminescence luminosity 500 (cd/m^2), the reduction-by-half life was 1200 hours.

[0129]The organic EL device was produced by the same method as Embodiment 15 except forming and using said comparison compound C instead of comparative example 2 compound (47). The luminescence luminosity in the direct-current voltage 20V of this element was 21000 (cd/m^2). When the constant current drive was carried out by the luminescence luminosity 500 (cd/m^2), the reduction-by-half life was 240 hours.

[0130]On Embodiments 8-36 and the glass board with an ITO electrode washed comparative example 3-6, vacuum deposition of the 4 and 4' bis[-] [N-(1-Naff Chll)-N-phenylamino] biphenyl (alpha-NPD) was carried out, and the hole injection layer of 30 nm of film thickness was formed. Subsequently, vacuum deposition of the compound of Table 1 was carried out, and the luminous layer of 30 nm of film thickness was obtained. Vacuum deposition of the bis (2-methyl 8-hydroxyquinolate)(phenolate) gallium complex was carried out, the electronic injection layer of 30 nm of film thickness was created, the electrode of 100 nm of film thickness was formed on it with the alloy which mixed silver with magnesium by 10:1 (weight ratio), and the organic EL device was obtained. Each layer was vapor-deposited under the conditions of substrate temperature room temperature in the vacuum of 10^{-6} Torr. The luminescent property of this element is shown in Table 2. All the organic EL devices of this example showed the high luminance property more than the maximum luminescence luminosity 35000 (cd/m^2). The organic EL device was produced by the same method as Embodiment 8 except forming and using said comparison compound A-D as a comparative example similarly. The luminescent property of this element is combined with Table 2, and is shown. It is clear that it is inferior to the element which created the maximum luminescence luminosity and the maximum luminous efficiency by this example in any case.

[0131]

[Table 2]

	化合物	発光輝度 (cd/m ²)	最大発光輝度 (cd/m ²)	最大発光効率 (lm/W)
実施例 8	化合物 (2)	4200	35100	3.5
実施例 9	化合物 (3)	4400	38800	3.8
実施例 10	化合物 (4)	4700	37600	3.8
実施例 11	化合物 (5)	5100	39200	3.8
実施例 12	化合物 (7)	4300	36500	3.5
実施例 13	化合物 (10)	4800	39800	3.8
実施例 14	化合物 (11)	4700	38500	3.7
実施例 15	化合物 (18)	4500	37300	3.5
実施例 16	化合物 (36)	4400	38900	3.8
実施例 17	化合物 (39)	5900	41600	4.1
実施例 18	化合物 (44)	5200	39500	3.9
実施例 19	化合物 (45)	5200	41100	4.2
実施例 20	化合物 (49)	5800	42300	4.3
実施例 21	化合物 (50)	5700	43100	4.3
実施例 22	化合物 (51)	5600	41900	4.1
実施例 23	化合物 (52)	5200	38800	3.9
実施例 24	化合物 (53)	5400	37500	4.0
実施例 25	化合物 (54)	4800	38800	3.7
実施例 26	化合物 (55)	4500	38900	3.8
実施例 27	化合物 (56)	4300	37800	3.5
実施例 28	化合物 (58)	5300	41300	4.0
実施例 29	化合物 (60)	4900	39800	3.8
実施例 30	化合物 (64)	4000	36100	3.5
実施例 31	化合物 (65)	4200	37200	3.6
実施例 32	化合物 (68)	4900	40100	4.0
実施例 33	化合物 (70)	4800	39500	3.8
実施例 34	化合物 (74)	4300	38500	4.0
実施例 35	化合物 (81)	4700	41100	3.9
実施例 36	化合物 (87)	4300	40500	3.8
比較例 3	比較化合物A	700	8500	0.8
比較例 4	比較化合物B	1000	9500	0.8
比較例 5	比較化合物C	1600	15000	1.3
比較例 6	比較化合物D	2700	25600	2.0

表中、発光輝度は直電7V印加時の値を表す。

[0132]On the glass board with an ITO electrode washed embodiment 37, vacuum deposition of alpha-NPD was carried out, and the hole injection layer of 20 nm of film thickness was obtained. Subsequently, vapor codeposition of Alq3 was carried out to the compound (61) of Table 1 by the weight ratio of 1:50, the luminous layer of 40 nm of film thickness was created, subsequently Alq3 was vapor-deposited, and the electronic injection layer of 30 nm of film thickness was obtained. On it, 0.5 nm was formed for lithium fluoride (LiF), the electrode was first, formed for aluminum (aluminum) by 200-nm vacuum deposition, and the organic EL device was obtained. Each layer was vapor-deposited under the conditions of substrate temperature room temperature in the vacuum of 10^{-6} Torr. As for this element, luminescence of the luminescence luminosity 6800 (cd/m²) in the direct-current voltage 7V, the maximum

luminescence luminosity $43200 \text{ (cd/m}^2\text{)}$, and luminous efficiency 4.1 (lm/W) was obtained.

[0133]The organic EL device was produced by the same method as Embodiment 8 except providing the thin film of 30 nm of film thickness which vapor-deposited the compound (4) and compound (49) of Table 1 with the wt. ratio of 1:10 as embodiment 38 luminous layer. As for this element, luminescence of the luminescence luminosity $6400 \text{ (cd/m}^2\text{)}$ in the direct-current voltage 7V, the maximum luminescence luminosity $39900 \text{ (cd/m}^2\text{)}$, and luminous efficiency 4.3 (lm/W) was obtained.

[0134]The organic EL device was produced by the same method as Embodiment 8 except providing the thin film of 30 nm of film thickness which vapor-deposited the compound (19) and bis(2-methyl 8-hydroxyquinolate)(phenolate) gallium complex of Table 1 with the wt. ratio of 1:50 as embodiment 39 luminous layer. As for this element, luminescence of the luminescence luminosity $6500 \text{ (cd/m}^2\text{)}$ in the direct-current voltage 7V, the maximum luminescence luminosity $37800 \text{ (cd/m}^2\text{)}$, and luminous efficiency 4.0 (lm/W) was obtained.

[0135]The organic EL device was produced by the same method as Embodiment 8 except providing the thin film of 30 nm of film thickness which vapor-deposited the compound (33) and alpha-NPD of Table 1 with the wt. ratio of 1:10 as embodiment 40 luminous layer. As for this element, luminescence of the luminescence luminosity $7200 \text{ (cd/m}^2\text{)}$ maximum luminescence luminosity $41300 \text{ (cd/m}^2\text{)}$ in the direct-current voltage 7V and luminous efficiency 4.2 (lm/W) was obtained.

[0136]The organic EL device was produced by the same method as Embodiment 8 except providing the thin film of 30 nm of film thickness which vapor-deposited the compound (82) of Table 1, and 2, 3, 6, 7, 10 and 11-hexamethoxy triphenylene with the wt. ratio of 1:10 as embodiment 41 luminous layer. As for this element, luminescence of the luminescence luminosity $7400 \text{ (cd/m}^2\text{)}$ maximum luminescence luminosity $43100 \text{ (cd/m}^2\text{)}$ in the direct-current voltage 7V and luminous efficiency 4.3 (lm/W) was obtained.

[0137]The organic EL device was produced by the same method as Embodiment 8 except providing the thin film of 30 nm of film thickness which vapor-deposited the compound (50) and DCJTb of Table 1 with the wt. ratio of 100:5 as embodiment 42 luminous layer. As for this element, luminescence of the luminescence luminosity $5200 \text{ (cd/m}^2\text{)}$ maximum luminescence luminosity $38200 \text{ (cd/m}^2\text{)}$ in the direct-current voltage 7V and luminous efficiency 3.4 (lm/W) was obtained.

[0138]On the glass board with an ITO electrode washed embodiment 43, vacuum deposition of alpha-NPD was carried out, and the hole injection layer of 40 nm of film thickness was obtained. Subsequently, after carrying out vacuum deposition of the compound (12) of Table 1 and forming the first luminous layer of 10 nm of film thickness, Carry out vacuum deposition of

the compound (49) of Table 1, and the second luminous layer of 30 nm of film thickness is created, Vacuum deposition of the bis(2-methyl 8-hydroxyquinolate)(phenolate) gallium complex was carried out, the electronic injection layer of 30 nm of film thickness was created, the electrode of 100 nm of film thickness was formed on it with the alloy which mixed silver with magnesium by 10:1 (weight ratio), and the organic EL device was obtained. Each layer was vapor-deposited under the conditions of substrate temperature room temperature in the vacuum of 10^{-6} Torr. As for this element, luminescence of the luminescence luminosity 6600 (cd/m^2) in the direct-current voltage 7V, the maximum luminescence luminosity 38300 (cd/m^2), and luminous efficiency 3.8 (lm/W) was obtained.

[0139]On the glass board with an ITO electrode washed embodiment 44, vacuum deposition of 4, 4', and the 4"-tris [N-(3-methylphenyl)-N-phenylamine] bird phenylamine was carried out, and the first hole injection layer of 60 nm of film thickness was obtained. Subsequently, vacuum deposition of alpha-NPD was carried out, and the second hole injection layer of 20 nm of film thickness was obtained. Vacuum deposition of the compound (45) of Table 1 was carried out, the luminous layer of 10 nm of film thickness was created, and also vacuum deposition of Alq3 was carried out and the electronic injection layer of 30 nm of film thickness was created. The electrode was formed by moreover carrying out 150-nm vacuum deposition of 0.2 nm of the aluminum for LiF subsequently, and the organic EL device was obtained. Each layer was vapor-deposited under the conditions of substrate temperature room temperature in the vacuum of 10^{-6} Torr. As for this element, luminescence of the luminescence luminosity 8400 (cd/m^2) in the direct-current voltage 7V, the maximum luminescence luminosity 43600 (cd/m^2), and luminous efficiency 4.4 (lm/W) was obtained.

[0140]The organic EL device was produced by the same method as Embodiment 44 except providing the thin film of 30 nm of film thickness which vapor-deposited the compound (49) of Table 1, and Alq3 with the wt. ratio of 1:100 as embodiment 45 luminous layer. As for this element, the luminescence luminosity 34800 (cd/m^2) in the direct-current voltage 7V and luminescence of luminous efficiency 4.2 (cd/A) were obtained. When the constant current drive was carried out by the luminescence luminosity 500 (cd/m^2), the reduction-by-half life was 1500 hours.

[0141]The organic EL device was produced by the same method as Embodiment 45 except using said comparison compound B instead of comparative example 7 compound (49). When the luminescence luminosity in the direct-current voltage 7V is 13000 (cd/m^2) and this element carried out the constant current drive by the luminescence luminosity 500 (cd/m^2), the reduction-by-half life was 250 hours.

[0142]The organic EL device was produced by the same method as Embodiment 45

Embodiment 464, 4', and except forming the hole injection layer of 20 nm of film thickness of copper phthalocyanine instead of 4"-tris [N-(3-methylphenyl)-N-phenylamino] bird phenylamine. As for this element, the luminescence luminosity 33100 (cd/m^2) in the direct-current voltage 7V and luminescence of luminous efficiency 4.0 (cd/A) were obtained. When the constant current drive was carried out by the luminescence luminosity 500 (cd/m^2), the reduction-by-half life was 1700 hours.

[0143]The organic EL device was produced by the same method as Embodiment 46 except using said comparison compound D instead of comparative example 8 compound (49). This element is the luminescence luminosity 15300 (cd/m^2) in the direct-current voltage 7V. When the constant current drive was carried out by the luminescence luminosity 500 (cd/m^2), the reduction-by-half life was 270 hours.

[0144]The organic EL device of this invention so that clearly from the embodiment described above Luminous efficiency, the increase of the luminescent material which attains improvement in luminescence luminosity, and reinforcement and is used collectively, doping material, electron hole pouring material, and electronic pouring material – admiration – an agent – element manufacturing methods, such as resin and electrode material, are not limited.

[0145]

[Effect of the Invention][the organic EL device which was used for the charge of organic EL device material of this invention, and was created] Since it is high-intensity and long lasting compared with the former, it can be conveniently used as flat-panel displays and plane photogens, such as a flat TV, and the application to light sources, such as a copying machine and a printer, light sources, such as a liquid crystal display and instruments, a display board, a beacon light, etc. is possible.

[Translation done.]